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Seventy-five of the most common questions concerning the Biological Sciences Curriculum Study (BSCS) are answered in this publication. Questions rane from fundamental ones concerning the history of the project, objectives, and availoility of materials to those of a more singular interest such as the distribution of the oyalties from the sale of the books. In addition, lists of BSCS publications availale both commercially and free from BSCS headquarters are provided. (BC)

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ABOUT BSCS BIOLOGY

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

Approximately 400 letters a month are received at BSCS headquarters in Boulder, Colorado, concerning various facets of the program of the Biological Sciences Curriculum Study. Because many of these letters request the same information, we have prepared this publication, which contains the most common questions asked us and our answers to them. Placed together in this fashion they provide an informative brochure dealing with areas of concern about the BSCS program.

Originally, these questions were selected and answers were prepared by the current chairman of the BSCS Steering and Executive Committees, Dr. Arnold B. Grobman, and appeared in NEWSLETTER Number 17 for March, 1963, and NEWSLETTER Number 22 in September of 1964. In the three years since 1964 many of the projects mentioned only as being in process in the earlier NEWSLETTERs have been completed and additional data have become available on which to base more critical analysis. Thus, while largely paralleling the original contribution by Dr. Grobman, this publication brings up-to-date both the questions and the answers which were sufficient in the context of three years ago but did not reflect the current status of the BSCS.

BSCS stands ready to answer additional questions not covered in this publication. Requests for such information should be addressed to the Director, BSCS, P.O. Box 930, Boulder, Colorado. Additional information on the BSCS program is available in the periodically distributed BSCS NEWSLETTER, free of charge upon request. For information on specific publications available commercially please contact the publishers of the BSCS materials listed at the end of this publication.

W. V. Mayer
Director, BSCS

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What is the background of the BSCS materials? Who prepared them? Under what sponsorship was the work undertaken?

In 1958, the BSCS was organized by the Education Committee of the American Institute of Biological Sciences (AIBS) with a membership of more than 85,000 biologists. The BSCS function was "to seek the improvement of biology education." To date, major support for the BSCS has come from National Science Foundation grants. Other grants such as those from the Rockefeller Foundation and the Asia Foundation have assisted BSCS activities. Fiscal responsibility for the BSCS was assumed by the University of Colorado in 1963, and in 1967 the University assumed general administrative and fiscal sponsorship of BSCS by establishing the Biological Sciences Curriculum Study Center at the University of Colorado.

General policy for the BSCS is established by a 27-member Steering Committee, which includes both professional biologists and educators at the college and secondary school level. The Chairman of the Executive and Steering Committees is Dr. Arnold B. Grobman, Dean, College of Arts and Sciences, Rutgers University. The Director is Dr. William V. Mayer, University of Colorado, Boulder.

The BSCS originally developed three parallel sets of course materials for high school biology: *Biological Science: Molecules to Man* (Blue Version), *High School Biology, BSCS Green Version*, and *Biological Science: An Inquiry Into Life* (Yellow Version). These were prepared by teams of writers working at Summer Writing Conferences during three successive years—1960, 1961, and 1962. Each Version includes a text, laboratory manual, and appropriate teacher's guides. In the years following each of the first two summers' work, the materials were widely tested and reviewed to give feedback for the succeeding rewriting. Writing teams were made up of research biologists and high school biology teachers.

In addition to the initial three Versions of the high school biology text, the BSCS subsequently produced *Biological Science: Patterns and Processes*, a 10th-grade book for the academically unsuccessful; *Biological Science: Interaction of Experiments and Ideas*, a non-repetitive second course; a set of six-week Laboratory Blocks dealing with specific topics in biology; a programmed sequence of filmed inquiries as Single Topic Films; a four-volume set of *Research Problems in Biology* for the superior student; and a series of Pamphlets on biological topics.

For the teacher BSCS has developed the *Biology Teachers' Handbook*; a series of Bulletins on biological education; a sequence of Special Publications on the implementation of the BSCS program; a sequence of Techniques Films covering various laboratory situations which are best explained through the medium of film; the BSCS NEWSLETTER, an informational publication sent free on request to those working with BSCS materials; Achievement Tests for each of the Versions, *Biological Science: Interaction of Experiments and Ideas*, and *Biological Science: Patterns and Processes*, as well as a Processes of Science Test that can be used as a pre- and post-test, and a Comprehensive Final for the three Versions of 10th-grade biology. The BSCS materials constitute a flexible program from which the teacher may select that portion which best suits his ability and interest in achieving his goals. The availability of these

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projects of the BSCS is delineated at the end of this publication. Other materials currently in the development stage will be announced in the NEWSLETTER as they are ready for use.

What are the aims and objectives of the BSCS Program?

The initial aim was to provide teachers with materials that properly reflect biology as a 20th-century science. To do this, the BSCS found it necessary to prepare introductory high school biology courses, suitable for wide use in the *average* high school, with *average* classes, to give students a basic understanding of science and of scientific processes; and in so doing, to build scientific literacy to aid in the preparation of the student for responsible adult citizenship. The primary objective is to teach science as a way of thinking—as a method of seeking answers. To accomplish this, underlying concepts and understandings are stressed. Student work is centered in the laboratory, where real problems are explored. Open-ended experiments and other materials are used as media for conveying an understanding of science. Through emphasis on basic concepts and the illustration of such concepts in varied ways, the student is given practice in analyzing data, drawing conclusions, seeking relationships from generalizations, and in finding his own answers.

How do BSCS Biology materials differ from materials previously available for this grade level? What is the justification for such differences?

BSCS Biology differs from conventional treatments in several ways:

First, all three Versions have significant unifying threads. This unity arises from the agreement of those concerned with BSCS Biology that nine basic emphases should be woven in and through each of the three Versions. These are:

Change of living things through time—evolution
Diversity of type and unity of pattern of living things
Genetic continuity of life
Complementarity of structure and function
Biological roots of behavior
Complementarity of organisms and environment
Regulation and homeostasis: the maintenance of life in the face of change
Science as inquiry
Intellectual history of biological concepts

Second, it is a general high school program that has resulted from a genuine cooperative approach among teams of research biologists, high school biology teachers, science educators, and other contributing specialists. It represents not a revision of old thinking in high school biology, but rather a completely new start based on the most up-to-date information in the field of biology. For example, where traditional texts primarily emphasize classical systematics and morphology, the organ and tissue level in biology, vocabulary, and rote memorization of isolated facts, the BSCS Versions place greater emphasis on other levels of biological organization, attempt a balance in subject matter, de-emphasize vocabulary as such, emphasize the scientific process and the concepts and principles of biological science.

Third, BSCS Biology puts a greater stress on laboratory work than did traditional texts. Teachers using BSCS materials report spending more than double the time of the class in the laboratory than they had done previously with traditional materials. Furthermore, the traditional illustrative type of laboratory exercise is de-emphasized and stress is given to investigative exercises which introduce the student to the inquiring processes of science.

It is the considered opinion of the producers of BSCS materials that unifying threads or themes as the structure for the high school biology course, as well as the different emphasis in terms of biological levels, more adequately reflect modern biology than did former approaches, even though excellent teachers in isolated situations had been teaching along these lines with considerable success for years, despite lack of proper classroom materials. The central position of the laboratory reflects the conviction that a student comes to understand science through participating in science, rather than by serving as a bystander who only reads about science, watches demonstrations, or routinely follows patterned expository work outlines.

Will BSCS High School Biology result in a national curriculum?

No. The BSCS materials are available to schools along with the more than two dozen other high school biology books. Individual schools and school systems are free to select from among the competing texts, which include the BSCS Biology books. The aim of the BSCS is not to "sell" books, but to provide models—to educators, publishers, textbook writers—of what competent research biologists, high school biology teachers, psychologists, and other specialists think are good ways of teaching general biology at the high school level. It is hoped that other writers will prepare their own materials after reviewing the BSCS books and that the entire area will be accordingly enriched.

By introducing additional materials, BSCS has had the effect of reducing the possibilities of a national curriculum by reducing teacher dependence upon the two books which were used in the majority of high schools in the United States prior to 1960.

What is the difference between the three BSCS Versions?

Biology as a field of knowledge can be thought of as a three-dimensional structure:

The levels of biological organization constitute one dimension.
The organizing conceptual schemes (BSCS themes) constitute a second dimension.
Kinds of organisms used for illustrative purposes constitute a third dimension.

Biological inquiry, as a method of obtaining knowledge, pervades the whole structure. When biology is conceived of in this way, specific facts and principles become meaningful as they are related to these dimensions. Without so relating them, specific facts and principles represent isolated clusters or bits of information; by so relating them, these bits become a part of an organized intellectual structure.

This does not mean that there is only one way of understanding biology as a field of knowledge; on the contrary, biology at the present time allows for a variety of views as to how its parts are interrelated. For example some biologists think of molecular biology as the fundamental area of biology upon which all other biological knowledge is based—that biochemistry is fundamental to an understanding of the evolution of living organisms. Others consider that reproduction, development, and evolution are the areas which deserve the major emphasis. Still other biologists consider the ecological and behavioral aspects of primary importance and feel that problems relating to the human species in the biosphere are the most appropriate for study by future citizens. These three, of the many possible ways of studying biology, are the basic approaches in *Biological Science: Molecules to Man* (Blue Version), *Biological Sci-*

ence: An Inquiry Into Life (Yellow Version), and *High School Biology, BSCS Green Version*, respectively.

These, then, are three particular interpretations of the relationships among the parts of biology. The three-dimensional structure presented above provides a general framework within which this variety of specific views is possible. It does not prejudice one or another particular view; rather it provides a framework within which this variety of particular views can better be understood.

The three approaches used in the Versions of BSCS Biology are all valid. There is no indication that any one Version is more suited to a rural or an urban setting, to a more or less sophisticated student body, nor to a more or less well-prepared teacher. The choice among the Versions is best made by the teacher based on his own background and interests, and on the assessment of the students' background and interest in the particular milieu in which they work.

What BSCS materials are available for use in high schools? What supplemental materials are available for the student?

Student materials for each Version include a text and a laboratory manual. These may be bound together or separately. The books are available only in sets including both lab and text, since both volumes are required for an integrated and balanced presentation of BSCS Biology.

Quarterly tests for each Version, as well as end-of-year tests suitable for all Versions, are available. A Processes of Science Test (POST) is usable for both a pre- and post-test for all three Versions. These tests were prepared by the BSCS, with technical assistance from a professional testing agency. A second course in high school biology entitled *Biological Science: Interaction of Experiments and Ideas* has been prepared, along with accompanying achievement tests.

Special material designed for the academically unsuccessful student is available as *Biological Science: Patterns and Processes*. For this course, too, a set of achievement tests has been developed.

There is a series of six-week Laboratory Block units available. Any one of these Blocks may be used to supplement any of the courses of BSCS Biology. Ten Blocks are available currently in commercial editions, while additional Blocks may be ordered from the BSCS in experimental editions.

Each Block is centered around one area of biology, and through the laboratory experiences therein, the student can gain a deep insight into the processes of scientific inquiry.

Other supplemental materials for use by students include: the BSCS Pamphlet Series of twenty-four pamphlets, with others projected; the selected bibliography included at the end of text chapters; and four volumes of *Research Problems in Biology*, a series of research prospectuses which may be used by the individual superior student as an out-of-class, long-range research activity.

A series of Single Topic Films is available and may be used in connection with BSCS Biology. This series consists of short, silent films that provide data for developing specific concepts found in BSCS Biology. The films are designed as inquiries into biological problems, with Teacher's Guides for directing the inquiry.

The wide array of BSCS instructional materials available for student use allows the teacher maximal flexibility of curriculum design to provide for almost every interest and ability group and to use to best advantage the specific teaching situation in which pupils and teacher operate.

What supplemental materials are available for the teachers? Are there suggestions for the teacher so that he can use BSCS materials to maximum advantage?

Each course of BSCS Biology includes appropriate Teacher's Manuals for both text and lab information specific to that course. These include the highlights of each section of the book as well as specific help with each chapter of the text and each of the laboratory exercises, with possible problems and pitfalls. In addition, the *Biology Teachers' Handbook* provides a more general BSCS orientation for the teacher, as well as specific information on such topics as statistics, physics, and chemistry necessary for 20th-century biology, a bibliography, film lists, testing information, and a special section called Invitations to Enquiry.

A series of nine BSCS Techniques Films, prepared primarily for teacher preparation purposes, illustrates frequently used laboratory techniques with which many teachers are not fully acquainted.

To aid the teacher in evaluation techniques, booklets of test questions keyed to the chapters of each Version are available through the Version publishers, in addition to the examinations mentioned previously. Model teaching schedules have also been prepared for teachers who desire them. Bulletins and Special Publications also provide the teacher with additional information relative to biological education. The BSCS NEWSLETTER, an informational publication about BSCS Biology, appears periodically and is sent to individual teachers free upon request to BSCS.

With its variety of instructional materials the BSCS has attempted to give the teacher every possible help with problems germane to the teaching of BSCS Biology.

Are the curriculum materials flexible enough to allow for modification or adaptation to an individual classroom or type of school? Can a teacher build his own course from BSCS materials, such as a course combining the best features of each of the three Versions?

To provide maximal flexibility the BSCS has prepared three Versions of a first high school biology course, as well as a second course and a course for the academically unsuccessful student. In the laboratory activities for each course far more exercises are included than any one class can complete in the normal time span available; thus, the teacher can select from this very wide range those exercises best suited to his particular class needs in any given year. Each course is less detailed than a conventional text, thus allowing more flexibility for teacher enrichment. Teachers can also pick and choose within sections of the text for areas of concentration and sections to be abridged. Each course may be supplemented by one or more of the Laboratory Block units, by supplemental reading from the Pamphlet Series, and by use of the Single Topic Films. The teacher may prefer to build his own course, using various BSCS resources such as the Pamphlets, Blocks, and Films.

However, it is recommended that teachers do not build a course combining materials from two or more Versions. While the courses were being developed each writing team had full access to the work of all others and so were able to incorporate the best ideas of all teams. Each Version is organized around unifying topics woven as threads through the materials. The authors have taken care to build on this approach—ecology, cellular biology, or molecular biology—so that the entire presentation represents a well-balanced, unified whole. To excerpt parts from two or more Versions would destroy the centralizing approach and, thus, result in a less effective, more disjunct presentation. While the BSCS recognizes that many other approaches than those

chosen for the three Versions can be used effectively to present modern biological concepts to high school students, it does not feel that combining different BSCS approaches would accomplish this purpose. Otherwise, the BSCS would have done so itself.

Can the BSCS lab guides be used to supplement a conventional biology text?

While it would be possible to use the lab guide from one of the BSCS Versions to supplement a conventional biology text, this is not recommended. Because the areas covered in each of the Versions of BSCS Biology and their organization are different from those in conventional texts, the BSCS laboratory exercises would not illustrate either the subject matter covered in a conventional text nor its order of presentation. Also, the BSCS lab manuals, because they are closely integrated with the BSCS texts, contain frequent cross references to the text for the particular Version. This would be confusing to the non-BSCS student; also, he might have difficulty completing the BSCS lab exercises in a satisfactory manner because of lack of related information separately presented in the BSCS text.

Will BSCS Biology materials be programmed?

The BSCS texts, as such, will not be programmed. However, specific programs such as those in *Biological Science: Patterns and Processes* have been developed; the individual programs focus on a major conceptual system or theory in biology which can best be presented in this fashion. Such programs constitute an additional method of instruction or a supplemental teaching aid, but are not a replacement for either the teacher, text, laboratory, or field work. Programming of laboratory exercises is considered undesirable in terms of the educational value of this student activity.

To what extent have the resources of the profession been used? Has previous research been reviewed and used?

From its beginning BSCS has sought and obtained the involvement of top level professional biologists, outstanding science educators and school administrators, psychologists, superior high school teachers, and students representative of typical high school populations. To date, exclusive of students, several thousand individuals have contributed directly to BSCS Biology. The actual writing was done by over 100 individuals—outstanding research biologists, educators, and high school biology teachers. Scores of individuals and organizations reviewed the materials. Some 1,000 teachers, who have tested the materials in their classrooms, have given their reactions and made suggestions for improvements and modifications. All these reactions were carefully considered in preparing the revised manuscripts.

Prior to the first Summer Writing Conference, the BSCS asked Dr. Paul DeH. Hurd of Stanford University to prepare a review of biology teaching, including the work of previous committees studying biology teaching, textbooks, and research in biology teaching since 1890. This summary, now available as BSCS Bulletin No. 1, served as background for the writers. All other available studies were consulted for pertinent information.

Was any classroom pretesting of the BSCS materials done? What kinds of schools were used for pretesting? What were the results of such pretesting, and what changes were made in the experimental materials to reflect these results? Was there any other kind of evaluation of the materials before they were put into final form?

Experimental editions of the BSCS Biology texts were used by well over a thousand teachers with over 200,000 students in the three years preceding each commercial publication. The books were tested in a wide variety of school situations. All courses have been used successfully in both large and small schools, in rural and urban areas, in every section of the United States, in public schools, and in private sectarian and nonsectarian schools.

During the first two years of testing each course, teachers sent back weekly reports on their classroom experiences with the BSCS textbooks. Students were examined with specially constructed tests to determine the extent to which they were learning those ideas that were considered important and the extent to which they could master "difficult" materials involving such "new" subject matter as chemistry, genetics, physiology, and microbiology.

It was clear that students had been able to learn the materials presented. Teacher reactions were overwhelmingly favorable, though suggesting many modifications to improve the experimental materials. Reviews by experts—biologists and educators—indicated that the materials, while still in an experimental form, clearly accomplished the purposes BSCS set out to achieve. Those who believe that biology mainly should be human anatomy and physiology fleshed out with hygiene and health and covered by a vocabulary-oriented mass of taxonomy and morphology find the program lacking in this traditional approach. However, it must be evaluated in terms of its own objectives. To do otherwise is as foolish as trying to measure distance in kilograms.

Testing of students is continuing, primarily for the purposes of developing new test items to accompany BSCS Biology, and to better describe the conditions under which the teaching of biology proceeds most effectively.

As a result of various evaluation methods, the commercial materials incorporated a number of changes. However, the basic nature and flavor of the experimental materials was not extensively changed.

For what group of students were the texts primarily intended? Were they prepared primarily with college-preparatory students in mind? Are they suitable for all students who take biology? What grade-level placement is recommended?

The primary purpose of the three Versions of BSCS Biology was to provide materials for the majority of high school students. Two and a half million 10th graders take biology each year; this involves a wider ability span for biology than it does for chemistry (850,000 students) and physics (400,000 students).

The three Versions are not intended for, nor are they generally suitable for use with, those students in the lowest 20 or 30 percent in general aptitude among all students who take high school biology. Such students often have a reading barrier which necessitates use of special classroom materials such as *Biological Science: Patterns and Processes*. (However, some teachers have found that many of these students do surprisingly well with the BSCS Version laboratory materials.) In some schools, biology may be elected in 10th, 11th, or 12th grades. While BSCS Biology was written with the 10th-grade student in mind, teachers seem pleased when using the materials at the 11th- and 12th-grade levels, although the more sophisticated, non-redundant *Biological Science: Interaction of Experiments and Ideas* has been produced for these grade levels.

About 40 test schools have used BSCS Biology at the 9th-grade level; generally, the 9th-grade students with whom the BSCS materials were used were of above average ability. Test results, as well as teacher reports, indicate that such above average 9th-grade students are able to handle the materials in a satisfactory manner. Average 9th-grade students do not perform as well as average 10th-grade students, however.

Major considerations in grade placement of BSCS Biology in the 9th as contrasted with the 10th grade are relative adequacy of laboratory facilities, the academic background of the teacher, and the level of ability of the students. Unless the laboratory facilities are adequate at the 9th grade, and unless a trained biology teacher—rather than a general science teacher—is available, it would appear unwise to teach BSCS Biology at the 9th-grade level to any students, regardless of academic ability.

What prior student knowledge is required for use of BSCS Biology materials?

Prior courses in chemistry and physics are not necessary for successful mastery of BSCS Biology. However, where students have had good previous experiences in junior high physical science and mathematics, the class may be able to move along more rapidly and pursue various areas of the BSCS course in greater depth. The chemistry, physics, and mathematics used in the BSCS books are explained in sufficient detail to be absorbed without prior background. It must be remembered that they are introduced as a means to learn something about biology—not as something to be learned for its own sake at this level. It would be an unfair tax, indeed, upon all concerned if biology courses also had to assume the burden of teaching detailed chemistry, mathematics, and physics.

What characteristics of the format and presentation of the materials promote their usefulness to students?

In preparing the books for publication, decisions concerning format were based primarily on educational efficiency, and only secondarily upon appearance.

Illustrations are not merely decorative; they were planned and executed as an integral part of the course materials. Color is used where it is deemed to be functional educationally.

There is no glossary in any of the Versions. Significant words are listed in the index. Through reference to the chapter where it occurs, the student can find the meaning of a word in context, rather than in an isolated list to be memorized and later to be tested upon. Thus, it is hoped to stress the functional use of biological terms rather than the isolated dictionary meaning.

End-of-chapter summaries and end-of-chapter discussion questions are included to assist the student in reviewing the materials studied. Such questions are often open ended to give the basis for an investigatory discussion rather than for rote repetition. Lab manual and text are fully integrated with each other.

Will teachers need specific preparation before introducing these materials in their classrooms? Where can such preparation be obtained? What type of preparation is most effective? Must the preparation be in the same Version the teacher uses in his class?

All teachers using the experimental editions of BSCS Biology were required to obtain some special preparation—through inservice institutes, summer institutes, special college courses, or the BSCS briefing sessions. The reason for this requirement during the experimental period was that the emphasis in BSCS courses was very different from that which teachers were accustomed to in traditional courses; also, much BSCS subject matter was not included in traditional courses and may not have been included in the teacher's academic preparation. Unless teachers understood the new approach and had adequate subject matter background, it was felt that the materials could not have received a fair trial during the evaluation.

Now that BSCS texts are commercially available for general use, it is to be hoped that school administrators will encourage many of their teachers to obtain any needed preparation before they adopt these materials. Many colleges and universities are adding preparation in BSCS Biology to their programs for pre-service teachers as well as for in-service teachers. Also, many school systems are holding workshops and in-service courses for their teachers. The BSCS has prepared a special publication—Special Publication No. 3, *BSCS Materials for Preparation of In-Service Teachers of Biology*—which is available to persons responsible for such teacher preparation programs. The BSCS Special Publication No. 4, *The Teacher and BSCS Special Materials*, deals with training teachers to use *Biological Science: Patterns and Processes*. BSCS Special Publication No. 5, *Laboratory Blocks in Teaching Biology*, was prepared to assist teachers using one or more of the Laboratory Blocks. The BSCS NEWSLETTER periodically lists those teacher training opportunities that have come to the attention of the BSCS.

Experience has indicated that a teacher receiving good preparation in one Version can effectively teach another Version. Also, the teacher is better prepared in an institute which concentrates on an entire Version, rather than one sampling among BSCS materials, trying to present highlights from all. (Such sampling particularly destroys the continuity of the themes and threads built into each Version.) In order to give teachers a choice of Versions, without breaking the continuity of each, some workshops and institutes have offered parallel sessions in each Version with joint sessions on such common subjects as philosophy of the BSCS and ways of implementing this philosophy in the classroom. Several institutes are currently adopting the Second Course, *Biological Science: Interaction of Experiments and Ideas*, for use with in-service teachers. It is the opinion of a number of science educators that these new materials provide the challenge of modern biology for the in-service teacher and prepare him to use the three Versions effectively.

Are BSCS Biology books more expensive than other books currently available? What does classroom implementation of the program require in terms of supplies and equipment?

The BSCS books are priced competitively with other texts and lab guides now on the market. (It should be kept in mind that the price of a student set of materials for BSCS Biology includes both text and lab guide.)

Teaching a laboratory-oriented biology course requires a good laboratory, whether the course is conventional or BSCS Biology. The cost of a *good* laboratory situation is not greater for BSCS Biology than for a traditional course. Initial cost for equipment depends upon the present status of the biology lab concerned. After the purchase of equipment, which may be spread over several years, the yearly laboratory costs for a BSCS course have been found to be actually less than for conventional courses. Microscopes

constitute the single largest item of expenditure in most cases.

It appears that where good facilities are available, their presence and correct use will contribute materially to an enriched program in biology. However, it should be pointed out that laboratory facilities in the schools in which BSCS Biology was tested vary widely—from schools with optimal laboratory facilities to those without running water in the lab.

A list of supplies and equipment for BSCS Biology is available in BSCS NEWSLETTERs No. 21, 25, and 29. Pertinent copies are available upon request. This listing includes supplies needed for each course and sources from which these may be obtained. No single cost figure for BSCS Biology and no complete list of supplies can be specific for any given teacher. Each course includes more lab exercises than any class will do, and so the supplies needed by any one teacher and the total cost of supplies for that teacher will depend to a large extent on the choices of exercises made. Thus, the only way that precise cost figures can be arrived at for a specific case is to decide which exercises will be carried out by students, and to figure the cost of these, less the value of materials and supplies already on hand. *Any computation of cost based on a complete list of all supplies needed for all labs in any course will be highly misleading, and will result in extreme overestimates of actual cost.* There is no *official* BSCS supplier, and some lists of materials commercially available have been padded with unnecessary items. The teacher should check carefully to ascertain that only the required materials are ordered.

Through what commercial channels are BSCS materials available? How were these channels chosen? How do sales of BSCS materials affect their content?

As the first step in the general procedure established for selecting publishers of BSCS materials, the American Textbook Publishers Institute was invited to call a meeting of all interested publishers, at which time the general nature of the BSCS materials was described and those publishers interested were invited to submit proposals. The proposals were reviewed by the BSCS staff and by a special review committee in consultation with the BSCS Executive Committee. The final contract was subject to review by the National Science Foundation. Comparable procedures are followed with other distributors.

All royalties on BSCS materials revert to the National Science Foundation for return to the U. S. Treasury. No such monies revert to BSCS or its authors, and thus sales incentives do not dictate content.

Will there be a continuing effort made to keep BSCS Biology up-to-date, or is this a one-time effort?

The rapid advances in the subject matter resulting from extensive research programs and development of new teaching and training techniques dictate periodic revisions so that materials will continue to be useful to those committed to their use.

The three Versions of BSCS Biology have been extensively revised and are now in press, to be available in January 1968. Revisions of other BSCS materials are now in the planning stage.

The BSCS maintains contact with BSCS teachers through the NEWSLETTER and an Area Consultant program, both of which serve to inform teachers of new developments in biology that relate to BSCS Biology, so that their teaching can continue to reflect new knowledge.

What is the relationship between the BSCS Single Topic Film program and the AIBS Film Project?

There is no connection whatever between the BSCS Single Topic Films and the AIBS Film Series. The AIBS Film Series is a secondary school biology course presented on film, with teacher and student manuals to supplement the film presentation. Information on the AIBS Film Series may be obtained from: AIBS, 3900 Wisconsin Ave., N.W., Washington, D.C. 20016, or the McGraw-Hill Company, New York.

Are any curriculum materials currently being prepared for biological science courses for the elementary and junior high schools, and for colleges by national curriculum studies?

The Commission on Undergraduate Education in the Biological Sciences (CUEBS) is concerned with collegiate teaching of biology. For information, write the Director, CUEBS, 1717 Massachusetts Ave., N.W., Washington, D.C., 20036.

The American Association for the Advancement of Science (AAAS), with financial support from the National Science Foundation, has been taking an active interest in science education from kindergarten to 9th grade. Inquiries concerning this AAAS program should be addressed to the Director of Education, AAAS, 1515 Massachusetts Ave., N.W., Washington, D. C., 20005.

The BSCS is conducting a series of conferences to establish guidelines for preparation of materials for the junior high level. As plans become definite, they will be announced in the BSCS NEWSLETTER.

Do the BSCS courses differ as to level of difficulty?

The goal of the BSCS writers was to produce the three Versions at similar levels of difficulty. A very extensive evaluation program has been concerned with this matter as well as with other aspects of the BSCS courses. Large numbers of students who had studied each of the three Versions were given the same comprehensive final examination. The differences among their scores amounted to less than one percent. This result indicated that the Versions were of equivalent difficulty and were of equivalent effectiveness in teaching high school biology.

Biological Science: Patterns and Processes is deliberately written at a difficulty level for the academically unsuccessful student. *Biological Science: Interaction of Experiments and Ideas* requires, as a second course, a prior exposure to biology and, while different, is no more difficult at its level than are the Versions at theirs.

When I examine the Versions, I seem to detect considerable differences in levels of difficulty.

To many teachers, one of the Versions does seem easier than the other two, though it is not always the same Version that seems easiest. One reason for this is the background of the teacher. Books dealing with familiar materials always seem easier. Teachers may tend to equate, perhaps unconsciously, something that is *different* with something that is *difficult*. Hence the more novel (different) the material and approach, the more difficult the books seem. For this reason, one or another of the BSCS materials may appear to be difficult to some teachers. On the other hand, almost all of the material is new to the entering biology student. He does not have the same standard of comparison a teacher

has and so to him no one approach is more difficult than another. Thus while one or another of the BSCS Versions may *seem* more difficult to a teacher, this has not been the case with the average student. Actually the Versions may be less difficult for the students than are conventional books because the effort to reduce technical terms to be memorized and the close interrelation of ideas should aid the student in both comprehension and retention.

What do you think of using one Version for the 10th grade and a second Version for an advanced course in the 11th or 12th grade?

Because there is a substantial amount of material common to all three Versions, this is not recommended. A student who had studied one of the Versions in 10th grade would be repeating much of this material if he studied a second BSCS Version in the 11th or 12th grade. The BSCS has developed a second course in biology which is available as *Biological Science: Interaction of Experiments and Ideas.* This non-repetitive course carries the student into further appreciations of the scientific enterprise without stifling his desire to gain new knowledge by redundant presentation of previously taught materials. The same point regarding repetition should be made concerning using a Version as a second course to follow a conventional 10th-grade course. While each of the BSCS Versions includes much material not found in traditional books, naturally not all the information and ideas formerly taught have been discarded, even though the manner and order of presentation may be new.

In our school we are going to use one of the Versions in the 9th grade so that students can have an extra year of science in senior high school. Do you have any suggestions about which Version to use?

Each of the BSCS Versions was designed for average and above average youngsters at the 10th grade. After careful evaluation of use at the 9th grade, we have concluded that the BSCS Versions may be used successfully with *above average* 9th graders. We do not recommend the use of any BSCS Version with unselected 9th graders.

Is it true that one of the Versions is more suitable for use in rural areas and another more suitable for use in urban areas because of the problem of field trips?

No. Each of the three Versions has been thoroughly tested in rural, suburban, and urban areas, and appropriate adjustments have been made in their design so that they might be used successfully in all of these situations. Many ecological observations can be made through use of a window box or an empty city lot as well as through a visit to an undisturbed semi-tropical beach.

Half of the biology teachers in our school wish to use one Version and the other teachers prefer a different Version. Please comment.

This may be an excellent procedure. It provides for multiple offerings in the school and permits teachers to use the program they prefer. Minor, but practical, problems would include reduced flexibility in transferring students from one section to another during the middle of the year, maintenance of a double book inventory, and a dual ordering of supplies.

In our state we have been told that the BSCS course is experimental and therefore only a small number of teachers will be permitted to use the books this year. How long is it intended that the BSCS courses will be experimental?

In the normal sense of the word "experimental," the BSCS courses could have been so considered during the period 1960-63, but at the present time the BSCS courses are probably less experimental than other biology courses currently available. The present form of the BSCS courses rests on an enormous amount of experimentation, evaluation, feedback, and consultation with teachers and students. Thus, these courses have been more adequately tested than the other biology course materials generally available, which are usually written by a single individual or small group and published without school trials and evaluation before being offered as educational instruments. In a rather special interpretation of the word, all good courses are "experimental" in that their designers and teachers are always interested in changing them and improving them as new conditions indicate. Hence a teacher who teaches a course with static content and finds that a new or different technique he has developed is more effective than the methods used previously is experimenting with his course. Good teachers are always experimenting in this fashion. However, the commercially published BSCS courses are *not* experimental in the sense of the question.

I have reviewed one of the BSCS courses and find that some of my favorite exercises—such as the dissection of the crayfish, the dissection of the frog, and the dissection of the earthworm—are not included. What BSCS exercises would you recommend be omitted so that I could include these favorite dissection exercises of mine?

None. This matter was considered carefully when the laboratory exercises were written and it was felt that the material presently included is of greater educational value than the materials omitted. It is extremely difficult for a teacher to refrain from presenting to his class material with which he is thoroughly familiar and which he has used repeatedly with satisfaction. A teacher must carefully consider the educational value of the material he would add and its compatibility with the course being used. It is recommended that teachers try one of the BSCS courses *as the writers intended* for at least two years before trying to introduce substitute exercises.

The BSCS courses do not include as much identification of animals and plants and several other subjects as we previously taught in our general biology. Do you think these aspects of biology are unimportant?

On the contrary. These are very important aspects of biology, but they should be started at the junior high level or earlier. When students are in elementary and junior high grades they are far more interested in identification than when they are at the senior high level, and we should take advantage of student interest at every level. Just because certain material is not stressed in the BSCS books does not mean that the BSCS writers consider it unimportant. Rather, it is a reflection of the fact that the present BSCS books comprise the selections by the BSCS writers of the materials they felt most significant and appropriate for 10th graders at the present time.

Is a BSCS Version a rigid course or could one deviate rather widely from it?

Both procedures are possible. The text and laboratory guides are designed to provide an interesting and modern course in biology for 10th graders. However, there is a tremendous amount of built-in flexibility. For example, in each Version there are many more laboratory exercises than could be completed in a year by any one class, thus the teacher has considerable opportunity for variation and flexibility in his choices among the exercises. Additional optional laboratory exercises are published in the BSCS NEWSLETTER from time to time, and these, too, could be substituted for Version exercises or used to extend them. Discussion sessions could be varied in an interesting fashion through the use of the Invitations to Enquiry from the BSCS *Biology Teachers' Handbook*. Any one of the Versions could be supplemented through use of one of the Laboratory Blocks. Furthermore, a teacher could select any one of the three Versions as his basic program and still achieve the same general BSCS goals. The BSCS Pamphlets could be used for supplementary readings. Other supplementary materials include Single Topic Films and *Research Problems in Biology*.

Do BSCS courses include evolution?

Yes. All BSCS courses cover evolution as a major scientific theory. To ignore evolution in biology is similar to ignoring atomic theory in physics. It is the single unifying conceptual scheme that places living phenomena in a meaningful integrated context.

Do BSCS courses teach the origin of man differently from the story of creation as presented in the Bible?

The BSCS courses deal solely with biology and not with theology. They do not attempt to bring scientific information either into conformity or into conflict with Biblical teachings.

Do BSCS courses include sex education?

The biological basis for mammalian reproduction is thoroughly discussed. It is presented as a major biological process; sex education, in its restricted sense, is not treated in BSCS courses.

Is it true that one of the BSCS courses is both traditional and modern?

Each of them is to some degree. Each course contains considerable basic biological information that has been known (and taught) for a long time and, to that extent, consists of traditional materials. But these materials are approached in fresh and new ways providing the distinctive flavor of the BSCS courses. In addition, the courses are thoroughly up-to-date in their coverage of the many facets of biology. Much of this modern material has been written by the research scientists who made the discoveries reported upon.

Who decided the final content of BSCS publications?

Responsibility for content of all BSCS publications has been under full control of the BSCS writers, who are research biologists and high school teachers. Content control has *not* been vested in the publishers.

How many books comprise a BSCS course?

For each Version there is a textbook, a laboratory manual, and a teacher's manual. The textbook and laboratory manual may be bound together in a single volume or bound separately in two volumes. The teacher's manual may be in one volume or two volumes. It is strongly recommended that a teacher using one of the Versions also use the BSCS *Biology Teachers' Handbook* for study and reference. There are also tests to accompany each Version for use during the year, and final examinations suitable for use with all Versions. The second course and the course for academically unsuccessful students have textbooks that include laboratory investigations; each course has a comprehensive teacher's handbook to accompany the text. Achievement tests for both of these courses have also been developed by BSCS.

Do teachers need special training before teaching a BSCS course?

This depends on the background of the teacher to a very large extent. Less preparation is needed if the teacher has had recent training in modern biology and understands inquiry and teaching methods useful in implementing an inquiry approach—including, among others, laboratory and field techniques. There are many teachers with good background who can teach a BSCS course without receiving additional training. For others, the BSCS *Biology Teachers' Handbook* may provide sufficient additional background. In fact, there are many competent teachers in the United States who, given sufficient time and facilities, could design (and have designed) their own courses which would be equivalent in educational value to the BSCS courses. However, many teachers have not had opportunities for such experiences in biology. In the education of a number of teachers, biology was presented in a didactic fashion and the laboratory exercises were primarily of the "cookbook" type wherein what is already known to both the student and the teacher is unimaginatively reaffirmed. Also, some may not have studied the newer areas developed in the BSCS courses such as population genetics. These teachers—and they may constitute a substantial number of biology teachers in America today—should review new materials and should have an opportunity to develop an appreciation and understanding of inquiry and investigation in science. They should have an opportunity to complete many of the laboratory exercises before they supervise students who will be trying these exercises themselves; and they should have an opportunity to overcome subject matter deficiencies. It is most important that prospective BSCS teachers understand the rationale of the BSCS courses and appreciate their objectives and goals.

I understand that the BSCS will provide a copy of the BSCS Biology Teachers' Handbook to each teacher using BSCS materials. How can I obtain a copy?

Originally, the BSCS provided a copy of the *Handbook* to each teacher using the 1963 edition of one of the Versions in his class as the major text. However, the supply of *Handbooks* for free distribution has been exhausted and this practice has been discontinued. Copies are still commercially available from John Wiley and Sons and the *Handbook* is used in a number of teacher training institutions as a text. Teachers desiring copies for their own use should order them through the publisher.

Does the BSCS course require more laboratory equipment and supplies than a conventional biology course?

The BSCS courses are laboratory-oriented biology courses, therefore, a reasonable amount of equipment and supplies is needed. This is true for any good, modern biology course that is laboratory oriented and there should be no substantial difference in cost of laboratory materials between BSCS courses and other modern biology courses. BSCS courses, if taught properly, will require more laboratory equipment and supplies than lecture courses. But savings on preserved specimens and models normally used in other courses can be directed to the purchase of living materials and cultures used in BSCS courses.

Catalogues from scientific supply houses seem to indicate that the BSCS courses require an excessive amount of laboratory equipment and supplies. What is your reaction to this?

The catalogues often give this impression. However, these catalogues list *all* of the equipment and materials needed for *every* BSCS laboratory exercise in a course—both the recommended and supplemental exercises for the entire course. Since the complete course includes many more laboratory exercises than any one class will attempt during the year, the impressions from the catalogues are misleading. (The purpose of this provision for additional exercises is to insure that teachers will have the desired degree of flexibility in organizing their own courses.) Before ordering materials, a teacher should go through the Laboratory Guide *and decide which exercises his classes will use during the year.* He should then order only the materials necessary for those exercises. Also, he should check to see what is on hand so that he does not order materials already available. (After the first year, this will obviously be less of a chore.) Further, such items as aluminum foil, string, thumb tacks, etc., can be more inexpensively obtained locally than by ordering through scientific supply houses. The teacher needs a petty cash fund readily available to take care of such local purchases. BSCS teachers who previously taught laboratory-oriented courses report that BSCS is not more expensive than their other courses, particularly after the first year of operation.

Is it recommended that one of the BSCS courses be supplemented with one of the BSCS Laboratory Blocks?

This is exactly the purpose for which the Laboratory Blocks were designed. Some teachers might find it desirable to use one of the Blocks as a supplement after they have had a year's experience with one of the courses. Each of the Blocks provides an opportunity to explore experimentally a limited area of biology. The choice of a Block should reflect the interests of the class and teacher.

In my district we will not have an opportunity to adopt a new text for some years. Would it be possible to use one of the Laboratory Blocks as a supplement to the non-BSCS textbook we are currently using?

This should work successfully. The Blocks are independent units and should be just as valuable a supplement to a non-BSCS course as to a BSCS course, provided the students have an opportunity to develop laboratory skills and the Block is taught with an inquiry approach.

Were the Blocks designed to provide students with Science Fair Projects?

No.

What is the BSCS doing for students who cannot use the regular materials?

The BSCS has developed *Biological Science: Patterns and Processes* for those academically unsuccessful students for whom the Versions are too difficult. This includes some low ability students now taking biology as well as some students who do not normally register for a biology course because they believe it would be too difficult or because they are counseled away from it.

Does Biological Science: Patterns and Processes comprise a full course?

The 1963-64 edition consisted of a few experimental units for feasibility testing in representative schools. The reaction of teachers and results of student testing were quite favorable and the units were improved on the basis of feedback and additional units prepared to make up a full one-year course, which was tested during 1964-65. During the latter half of 1965 the materials were again rewritten on the basis of feedback and published commercially by Holt, Rinehart and Winston of New York City.

We have a three-track system in our district and I wonder what your recommendations for BSCS Biology would be?

Slow lane:	*Biological Science: Patterns and Processes*
Medium lane:	One of the Versions
Fast lane:	One of the Versions plus one of the Laboratory Blocks supplemented with Pamphlets, *Research Problems in Biology*, and Single Topic Films.

Do Research Problems in Biology contain suggestions for Science Fair Projects?

No. *Research Problems in Biology* were not designed for students seeking Science Fair Projects. They include relatively sophisticated prospectuses of long-term investigations for science-oriented students. The prospectuses are not designed for average youngsters faced with the necessity of preparing a short-term Science Fair Project.

Could a biology course be organized around three or four of the Laboratory Blocks?

This would make a very interesting course. Teachers who are so inclined to experiment with such use of Blocks are urged to keep BSCS informed of their successes and failures. Some teachers may wish to design their own second level courses in this fashion. *Biological Science: Interaction of Experiments and Ideas*, the BSCS Second Course, was initiated in this way.

Could the Laboratory Blocks be used in college classes?

They should have a special value in teacher preparation classes to help teachers appreciate methods of inquiry beyond those presented in other BSCS materials, and there may be other collegiate situations in which they will prove to be useful. Some experimental work has been undertaken using the Blocks in this fashion as an introductory college laboratory course in biology.

Is the BSCS Second Course an accelerated course for bright students?

No. This is a second course in biology, to follow a first high school course, preferably one of the Versions. It is intended for the student who is interested in biology and wants further work. Some of these students may be planning a career in biology, others may not.

What is the relationship between the BSCS and the Advanced Placement Program?

There is no formal association between the two organizations. Neither the three BSCS Versions nor the Second Course was designed to serve as a collegiate course to be taught in the high schools.

Are the College Entrance Examination Board tests in biology appropriate for BSCS students?

Through the courtesy of CEEB, two special committees of BSCS have had the opportunity to examine recent CEEB biology tests. These committees were aided by independent reviewers from the fields of biology and psychometrics. It was the unanimous opinion of those involved that the CEEB tests examined do not adequately test for the kinds of learnings that the BSCS hopes will be achieved through the study of one of the BSCS Versions, despite the fact that BSCS students were not discriminated against by the use of these examinations. The CEEB Biology tests examined do not provide full opportunity for BSCS students to adequately demonstrate what they have learned. This leads to the position that the CEEB Biology tests are not now as appropriate a measure of achievement for BSCS students as is the BSCS Comprehensive Final Exam.

The BSCS has been in communication with CEEB over the past several years on this problem and it is hoped that a satisfactory solution will be found in the near future.

Many colleges and universities (Amherst, Johns Hopkins, Barnard, Kansas State Teachers) are modifying their own biology course in order to reflect the more sophisticated preparation the students of the new high school biology programs are bringing with them as they enter college. It is clear that BSCS students are well prepared for collegiate biology courses.

Has the BSCS produced any films?

The BSCS has produced a series of Techniques Films designed primarily to acquaint teachers with common laboratory techniques with which they may not have become familiar because of recent advances in techniques or through gaps in their own academic preparation. The BSCS also has prepared a series of Single Topic Films which will be available in the fall of 1967. They are short filmed inquiries with detailed teacher's guides to the use of each. BSCS Single Topic Films are designed to encourage an attitude of inquiry. They pose questions, raise problems, and present experimental data which challenge student participation. The BSCS has also produced an Information Film, *The Story of the BSCS*, which is available for free loan upon request.

I have seen a BSCS list of recommended films from one of the film-producing companies. Has the BSCS produced such lists for other companies as well?

The list you saw was not prepared by the BSCS. The BSCS has not produced a recommended list of films to accompany the BSCS courses. The only "official" recommendations made by the BSCS are those made by the BSCS writers and included in the Teacher's Guides and the BSCS *Biology Teachers' Handbook*. While lists published by some of the film-producing companies may superficially appear to be BSCS lists prepared by BSCS staff members, and may actually have been written by persons associated at one time with the BSCS, they are not official BSCS lists and do not necessarily reflect BSCS attitudes regarding use of films with BSCS materials.

What is the position of the BSCS regarding supplementary films for use with BSCS materials?

The use of films to supplement the BSCS materials in the classroom should be approached with care by the teacher. A good film can illustrate experiences that would not otherwise be possible for students. On the other hand, a purely informational film tends to make spectators of the students, instead of participants. Since the BSCS programs are essentially inquiry and laboratory oriented, the objectives of the BSCS program may be subverted by the use of supplementary films of an informational nature. It is for this reason that the BSCS developed its Single Topic Film series. These films are specifically designed to evoke inquiry and participation from the student. They present data from which the student is asked to form and evaluate hypotheses. The Single Topic Films may be used to reinforce the underlying BSCS theme that science is a process of inquiry.

What is the BSCS policy on the programming of its materials?

The BSCS has no policy on this matter. However, developing an appreciation and an understanding of investigation seems to be beyond the present techniques of programming. Certain aspects of the BSCS course are suitable for programming and are made available to the teacher to use as a supplementary teaching device, particularly for those in the class who did not grasp the topic during its regular presentation. Such programming is included in *Biological Science: Patterns and Processes*. Certain other skills and techniques might lend themselves to programming.

What happens to the royalty income derived from the sale of BSCS books?

These funds are ultimately returned to the United States Treasury. There are no royalties paid to individual writers.

Does the BSCS plan to revise the Versions?

Yes. The BSCS has prepared revisions of the three Versions to be available in 1968.

What effect has the BSCS program had on student achievement in college?

Early in 1966 Dr. Arnold B. Grobman, Chairman of the Steering Committee, made a survey regarding this problem. He wrote to 200 biology departments in all types of colleges and universities. On the basis of answers to his questionnaire the following information was elicited: students who have had the BSCS Second Course are far more likely to major in biology than students who have had a traditional advanced placement course. These students seem to be about equal to those who have completed a full year of a

freshman collegiate biology course. Interest in biology on the part of majors and non-majors alike seems to be increasing and is partly related to the new high school courses. Freshman courses are being upgraded in a number of colleges because of the BSCS preparation of students. The better work in college biology is also a reflection of newer high school chemistry and mathematics courses. The BSCS students tend to be impatient with traditional college freshman courses while students taught in the conventional way often find them challenging. BSCS students seem to have a slight edge in handling tests, in working in the laboratory, in entering into discussions, and in understanding the nature of science. An unusually high proportion of the best students seem to have BSCS background, but this may reflect the general progressiveness of the selected high schools from which the colleges drew students.

What preparations are colleges making for the students trained in the BSCS program?

A great contribution of the BSCS program has been the jogging of some college teachers out of their present complacency. In some colleges where BSCS students demonstrate more proficiency than non-BSCS students, they are exempted from part or all of their freshman biology. A number of colleges are making initial efforts to prepare the teachers of the local areas to handle BSCS programs. A significant number of others are in the process of drastically changing their own biology courses and some have begun planning to offer different kinds of freshman biology.

Do you expect the impact of BSCS secondary school courses to be greater or less in future years?

It is expected to be greater. A typical example is one college which has assembled comparative data over a three-year period shows that in the 1963-64 freshman class 3% entered with a BSCS background. The following year 10% entered and in 1965-66, 19%. The BSCS impact on college freshman courses began to be marked in 1966-67 when about a quarter of the incoming students had BSCS training. It is anticipated that about 80% of the incoming freshman in 1970-71 will have had such training.

Has the BSCS program had any effect on graduate schools?

It is too early to tell. The very first students with any BSCS experience will reach graduate school in 1967-68. The beginnings of the wave of those with BSCS training in the 1963 commercial edition will be felt in the entering class of 1970 and the full impact will not be felt until 1974. If present evidence is indicative, the students should tend to be somewhat more sophisticated scientifically and somewhat better prepared and more oriented toward research than previously.

Has the BSCS had any effect on biological education outside the continental limits of the United States?

Yes. With the appearance of the BSCS experimental materials numerous inquiries were received from other countries regarding the possibility of using BSCS materials and the BSCS approach in indigenous biology programs.

Have the BSCS materials been translated into languages other than English?

The BSCS does not authorize direct translations of its materials into other languages for two reasons. The first is that the educational system in other countries is not geared primarily to a single course in the 10th grade, but may vary so that the student will have two years of biology, taken concurrently with chemistry, physics, or other sciences. Thus, the student has a different background and approach in many areas that is not similar to the scheduling in the United States. The second reason is that, unlike those of mathematics, chemistry, or physics, the principles of biology are illustrated with local examples which vary widely throughout the world. It is not feasible, for example, to expect students studying biology in India to have a true appreciation of the subject when they read about the northern temperate biota of England, which may deal with robins and birch trees, while the student himself is seeing myna birds and bamboo. For these students, temperate biology becomes a mythological thing and biology in general something that occurs "somewhere else." To alleviate this situation the BSCS has worked with interested countries to form teams of biologists who will adapt the BSCS materials to the local situation, both educationally and in terms of the biota of the region.

Have other countries produced biology texts based on the BSCS?

Yes. The Philippine Islands currently are using a locally produced book which is an adaptation of the BSCS Green Version. There has been a Tropical BSCS Version produced in Colombia for use in Central and Tropical South America. An adaptation of the Blue Version has been produced in Japan. Australia has published a text based on BSCS materials. Over thirty countries are currently involved in adaptation projects of various kinds, developing indigenous biology materials based on the BSCS program. These include such countries as Argentina, Ceylon, Denmark, England, India, Israel, Italy, New Zealand, Thailand, Turkey, and Venezuela, to name only a few.

BSCS Publications available through commercial distributors:

Blue Version—*Biological Science: Molecules to Man*: Houghton Mifflin Co., 110 Tremont St., Boston, Mass. 02107.
Green Version—*High School Biology, BSCS Green Version*: Rand McNally & Co., P.O. Box 7600, Chicago, Ill. 60680.
Yellow Version—*Biological Science: An Inquiry Into Life*: Harcourt, Brace & World, Inc., 757 Third Ave., New York, N.Y. 10017.

Comprehensive Final Exam for all versions: The Psychological Corp., 304 E. 45th St., New York, N.Y. 10017.
Version Quarterly Tests (Available through the version publishers.)
Version Test Booklets (Available through the version publishers.)

Second Course—*Biological Science: Interaction of Experiments and Ideas*: Prentice-Hall, Inc., Englewood Cliffs, N.J. 07632.
Second Course Tests—*Quarterly Tests and Final Examination*: Prentice-Hall, Inc., Englewood Cliffs, N.J. 07632.

Special Materials—*Biological Science: Patterns and Processes*: Holt, Rinehart and Winston, Inc., 383 Madison Ave., New York, N.Y. 10017.

Special Materials Tests—*Unit Tests and Final Examination*: The Psychological Corp., 304 E. 45th St., New York, N.Y. 10017.

Laboratory Blocks—*Plant Growth and Development; Animal Growth and Development; Microbes: Their Growth, Nutrition, and Interaction; The Complementarity of Structure and Function; Field Ecology; Regulation in Plants by Hormones—A Study in Experimental Design; Animal Behavior; Life in the Soil; Genetic Continuity; Physiological Adaptation*: D.C. Heath & Co., 285 Columbus Ave., Boston, Mass. 02116.

Laboratory Innovations—*Innovations in Equipment and Techniques for the Biology Teaching Laboratory*: D. C. Heath & Co., 285 Columbus Ave., Boston, Mass. 02116.

Teachers' Handbook—*Biology Teachers' Handbook*: John Wiley & Sons, Inc., 605 Third Ave., New York, N.Y. 10016.

Biological Investigations for Secondary School Students—*Research Problems in Biology: Investigations for Students, Series One, Two, Three, and Four*: Doubleday & Co., 277 Park Ave., New York, N.Y. 10017.

BSCS Pamphlet Series—*Animal Language; Biodiversity; Biogeography; Biological Clocks; Biology of Coral Atolls; Biology of Termites; Biomechanics of the Body; Blood Cell Physiology; Cell Division; Cellulose in Animal Nutrition; Courtship in Animals; Early Evolution of Life; Ecology of the African Elephant; Growth and Age; Guideposts of Animal Navigation; Hibernation; Homeostatic Regulation; Metabolites of the Sea; Photoperiodism in Animals; Photosynthesis; Plant Systematics; Population Genetics; Present Problems About the Past; Slime Molds and Research*: D.C. Heath & Co., 285 Columbus Ave., Boston, Mass. 02116.

Techniques Films (16mm sound or 8mm loop, silent)—*Bacteriological Techniques; Culturing Slime Mold Plasmodium; Genetics: Techniques Handling Drosophila; Histological Techniques; Measuring Techniques; Neurospora Techniques; Paper Chromatography; Removing Frog Pituitary; Smear and Squash Techniques; Weighing Techniques*: Thorne Films, 1229 University Ave., Boulder, Colo. 80302.

Single Topic Films (Super 8mm loop)— *Social Behavior in Chickens; Prairies and Deciduous Forests; The Peppered Moth: A Population Study; Mimicry; Water and Desert Plants; Water and Desert Animals; Temperature and Activity in Reptiles; Mountain Trees—An Ecological Study; The Kidney and Homeostasis; Phototropism; Convergence; Australian Marsupials; The Intertidal Region; Life in the Intertidal Region; Predation and Protection in the Ocean; Mating Behavior in the Cockroach; An Inquiry—The Importance of the Nucleus; Mitosis; An Example of the Biological Significance of Color; Grouse—A Species Problem*: Harcourt, Brace & World, Inc., 757 Third Ave., New York, N. Y. 10017; Houghton Mifflin Company, 110 Tremont St., Boston, Mass 02107; Rand McNally & Co., P. O. Box 7660, Chicago, Ill. 60680.

BSCS Publications available from the BSCS:

BSCS Bulletin Series: (3 titles).

BSCS NEWSLETTER.

BSCS Special Publication Series (Concerned with teacher preparation).

Laboratory Blocks, experimental editions.

BSCS INTERNATIONAL NEWS NOTES.

BSCS Information Film: *The Story of the BSCS* (Revised). (Free loan upon request.)

Supplies and Equipment for BSCS Biology: BSCS NEWSLETTERS 21, 25, and 29, BSCS Bulletin No. 3. There are no "official" or "recommended" BSCS suppliers.